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EXAMINER
LI, SHI K

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/936,074	Applicant(s) HABER ET AL.	
	Examiner Shi K. Li	Art Unit 2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 22 February 2005.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 187-246 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 187-246 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 22 February 2005 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 224-225 are rejected under 35 U.S.C. 102(e) as being anticipated by Willebrand (U.S. Patent 6,239,888 B1).

Regarding claim 224, Willebrand discloses in FIG. 10 an optical space communication system with transceiver 30 for transmitting a data-carrying light beam through atmosphere to a remote transceiver where the light beam is received and directed into a fiber 34. FIG. 10 also includes EDFA 36 for changing the amplitude of the received beam and controller 100 for varying the amplification of the EDFA.

Regarding claim 225, Willebrand teaches WDM system (see col. 8, lines 19-20).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 187-189, 197, 201, 204, 210-211, 217, 220, 222, 224 and 240 are rejected under 35 U.S.C. 103(a) as being unpatentable over Javitt et al. (U.S. Patent 6,031,648) in view of Heidemann (U.S. Patent 5,335,109).

Regarding claims 187, 217 and 224, Javitt et al. teaches in FIG. 1 an optical space communication system comprising a transmitter 70 for sending light beam 72 over free space (e.g., the earth's atmosphere), and a receiver 80 for receiving the light beam. Javitt et al. includes in FIG. 1 automatic gain control (AGC) 150 with variable amplification. The differences between Javitt et al. and the claimed invention are (a) Javitt et al. does not teach to direct a received beam into a fiber, and (b) Javitt et al. controls the signal in the electrical domain. It is well known in the art that AGC can be done in optical domain. For example, Heidemann teaches in FIG. 1 an optical receiver with an optical pre-amp 10 whose amplification or attenuation is variable under control of AGC 7. Heidemann also teaches in FIG. 1 an erbium-doped fiber (EDF) 3. Heidemann suggests in col. 1, line 42 that the optical amplifier can provide gain or attenuation. One of ordinary skill in the art would have been motivated to combine the teaching of Heidemann with the optical space communication system of Javitt et al. because processing signal in optical domain has the advantages of large bandwidth, large dynamic range, high sensitivity and immunity to overloading photodetector. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to control the amplification or attenuation in optical domain, as taught by Heidemann, in the optical space communication system of Javitt et al. because processing signal in optical domain has the advantages of large bandwidth, large dynamic range, high sensitivity and immunity to overloading photodetector.

Regarding claim 188-189, Javitt et al. teaches in col. 1, line 28-30 that atmosphere causes fluctuation in beam strength and the variable gain amplifier is for compensating such fluctuation and keeping the received signal strength to be constant.

Regarding claim 197, Heidemann teaches optical amplifier 10.

Regarding claim 201, Javitt et al. teaches in col. 1, lines 12-15 that the free-space communication may be used for distributing telecommunication service to subscribers, which is outdoor application.

Regarding claims 204, 210-211 and 220, Heidemann teaches in col. 1, lines 54 that the invention can achieve a dynamic range of 80 dB.

Regarding claim 222 and 240, Heidemann suggests in col. 1, line 42 that amplitude is controlled by attenuating.

5. Claims 187-189, 197, 199-201, 205-206, 240-242 and 244 are rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand (U.S. Patent 6,239,888 B1) in view of Britz et al. (U.S. Patent 6,122,084).

Regarding claims 187 and 240, Willebrand discloses in FIG. 10 an optical space communication system with transceiver 30 for transmitting a data-carrying light beam through atmosphere to a remote transceiver where the light beam is received and directed into a fiber 34. FIG. 10 also includes EDFA 36 for changing the amplitude of the received beam and controller 100 for varying the amplification of the EDFA. The difference between Willebrand and the claimed invention is that Willebrand does not teach that the amplitude change comprises attenuations. Britz et al. teaches in FIG. 5B an optical receiver comprising an optical attenuation filters (OAF) 62 under the control of a control circuit. One of ordinary skill in the art would

have been motivated to combine the teaching of Britz et al. with the optical space communication system of Willebrand because the OAF attenuates optical power level of input signal to a safe operating range. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include variable attenuator, as taught by Britz et al., in the optical space communication system of Willebrand because the OAF attenuates optical power level of input signal to a safe operating range.

Regarding claim 188-189, Willebrand teaches in col. 13, lines 50-552 to continually regulate power level to accommodate changing atmospheric and other conditions.

Regarding claim 197, Willebrand teaches in FIG. 10 variable EDFA 36.

Regarding claims 199 and 200, Willebrand teaches in FIG. 2 an optical space communication system with transceiver 30 for transmitting a data-carrying light beam through atmosphere to a remote transceiver where the light beam is received and directed into a fiber 34. FIG. 2 also includes EDFA 36 for changing the amplitude of the received beam. The difference between Willebrand and the claimed invention is that Willebrand does not include a variable amplification or attenuation. Britz et al. teaches in FIG. 5B an optical receiver comprising an optical attenuation filters (OAF) 62 under the control of a control circuit. One of ordinary skill in the art would have been motivated to combine the teaching of Britz et al. with the optical space communication system of Willebrand because the OAF attenuates optical power level of input signal to a safe operating range. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include variable attenuator, as taught by Britz et al., in the optical space communication system of Willebrand because the OAF attenuates optical power level of input signal to a safe operating range. The modified space communication system

of Willebrand and Britz et al. would comprise an amplifier of constant gain and a variable attenuator.

Regarding claim 201, Willebrand includes in FIG. 1 mountain 29 and, therefore, suggests that the application is outdoors.

Regarding claims 205 and 241, Willebrand teaches WDM system (see col. 8, lines 19-20).

Regarding claim 206, Willebrand teaches in col. 10, lines 41-44 to use a single mode fiber for the EDFA.

Regarding claim 242, Willebrand teaches in FIG. 10 a feedback control circuit for controlling the EDFA such that a wavelength as constant power.

Regarding claim 244, Britz et al. teaches in FIG. 5B OAF 62.

6. Claims 190 and 214 are rejected under 35 U.S.C. 103(a) as being unpatentable over Javitt et al. and Heidemann as applied to claims 187-189, 197, 201, 204, 210-211, 217, 220, 222, 224 and 240 above, and further in view of Britz et al. (U.S. Patent 6,122,084).

Javitt et al. and Heidemann have been discussed above in regard to claims 187-189, 197, 201, 204, 210-211, 217, 220, 222, 224 and 240. The difference between Javitt et al. and Heidemann and the claimed invention is that Javitt et al. and Heidemann do not teach to determine average power level of the received beam for amplification control. Britz et al. teaches in FIG. 5B an optical receiver comprising an optical attenuation filters (OAF) 62 under the control of a control circuit. One of ordinary skill in the art would have been motivated to combine the teaching of Britz et al. with the modified optical space communication system of Javitt et al. and Heidemann because the OAF attenuates optical power level of input signal to a

safe operating range. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include variable attenuator, as taught by Britz et al., in the modified optical space communication system of Javitt et al. and Heidemann because the OAF attenuates optical power level of input signal to a safe operating range.

7. Claims 191-194, 215, 221 and 233 are rejected under 35 U.S.C. 103(a) as being unpatentable over Javitt et al. and Heidemann as applied to claims 187-189, 197, 201, 204, 210-211, 217, 220, 222 and 224 above, and further in view of Sugawara (U.S. Patent 6,057,951).

Javitt et al. and Heidemann have been discussed above in regard to claims 187-189, 197, 201, 204, 210-211, 217, 220, 222 and 224. Regarding claim 191, the difference between Javitt et al. and Heidemann and the claimed invention is that Javitt et al. and Heidemann do not teach determining momentary power of received beam. Sugawara teaches in FIG. 9 an optical fiber amplifier 1 with variable gain. FIG. 9 includes a peak detection circuit to detect transient surge and reduce gain of the amplifier to protect optical detector 2 from damage as illustrated in FIG. 11. One of ordinary skill in the art would have been motivated to combine the teaching of Sugawara with the modified optical space communication system of Javitt et al. and Heidemann because it suppresses transient surge to protect optical detector from damage. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to detect momentary power, as taught by Sugawara, in the modified optical space communication system of Javitt et al. and Heidemann because it suppresses transient surge to protect optical detector from damage.

Regarding claims 192-193, Sugawara teaches in FIG. 9 splitter 14 at the output of optical fiber amplifier, and output level detection circuit 15.

Regarding claims 194, 215, 221 and 233, the difference between Javitt et al. and Heidemann and the claimed invention is that Javitt et al. and Heidemann do not teach to keep output light beam at a substantially constant power. Sugawara teaches in FIG. 13 an optical fiber amplifier 1 with variable gain. Sugawara teaches in FIG. 14 that output optical power is at a constant. One of ordinary skill in the art would have been motivated to combine the teaching of Sugawara with the modified optical space communication system of Javitt et al. and Heidemann because a constant power level gives the optical detector an optimal performance. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to control the amplifier to give a constant output power level, as taught by Sugawara, in the modified optical space communication system of Javitt et al. and Heidemann because a constant power level gives the optical detector an optimal performance.

8. Claims 195-196, 198 and 207-208 are rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand and Britz et al. as applied to claims 187-189, 197, 199-201, 205-206, 240-242 and 244 above, and further in view of Okamura (H. Okamura, "Automatic Optical Loss Compensation with Erbium-Doped Fiber Amplifier", Journal of Lightwave Technology, Vol. 10, No. 8, August 1992).

Willebrand and Britz et al. have been discussed above in regard to claims 187-189, 197, 199-201, 205-206, 240-242 and 244. The difference between Willebrand and Britz et al. and the claimed invention is that Willebrand and Britz et al. do not teach a high change rate amplifier. Okamura teaches in FIG. 1 an optical amplifier with fast frequency response. Okamura illustrates in FIG. 13 that the amplitude changing rate is at least 1 KHz. One of ordinary skill in the art would have been motivated to combine the teaching of Okamura with the modified space

communication system of Willebrand and Britz et al. because the amplifier of Okamura can eliminate unwanted fast optical loss variation. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an optical amplifier with fast frequency response, as taught by Okamura, in the modified space communication system of Willebrand and Britz et al. because the amplifier of Okamura can eliminate unwanted fast optical loss variation.

9. Claims 195-196, 207-208, 218 and 246 are rejected under 35 U.S.C. 103(a) as being unpatentable over Javitt et al. and Heidemann as applied to claims 187-189, 197, 201, 204, 210-211, 217, 220, 222, 224 and 240 above, and further in view of Okamura (H. Okamura, "Automatic Optical Loss Compensation with Erbium-Doped Fiber Amplifier", Journal of Lightwave Technology, Vol. 10, No. 8, August 1992).

Javitt et al. and Heidemann have been discussed above in regard to claims 187-189, 197, 201, 204, 210-211, 217, 220, 222, 224 and 240. The difference between Javitt et al. and Heidemann and the claimed invention is that Javitt et al. and Heidemann do not teach a high change rate amplifier. Okamura teaches in FIG. 1 an optical amplifier with fast frequency response. Okamura illustrates in FIG. 13 that the amplitude changing rate is at least 1 KHz. One of ordinary skill in the art would have been motivated to combine the teaching of Okamura with the modified space communication system of Javitt et al. and Heidemann because the amplifier of Okamura can eliminate unwanted fast optical loss variation. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an optical amplifier with fast frequency response, as taught by Okamura, in the modified space communication

system of Javitt et al. and Heidemann because the amplifier of Okamura can eliminate unwanted fast optical loss variation.

10. Claims 202-203 are rejected under 35 U.S.C. 103(a) as being unpatentable over Javitt et al. and Heidemann as applied to claims 187-189, 195-200, 204, 207-208, 210-211, 214, 217-218, 220, 222 and 229 above, and further in view of Dodley et al. (U.S. Patent 5,966,229).

Javitt et al. and Heidemann have been discussed above in regard to claims 187-189, 195-200, 204, 207-208, 210-211, 214, 217-218, 220, 222 and 229. The difference between Javitt et al. and Heidemann and the claimed invention is that Javitt et al. and Heidemann do not teach a distance that the transmitting beam can travel. Dodley et al. teaches in col. 5, line 20 an equation for calculating attenuation of atmosphere. Dodley et al. also teaches in col. 4, line 58-59 that with appropriate laser and photodetector, distance between transmitter and receiver is typically range of 100 meters to 10 Km. One of ordinary skill in the art would have motivated to combine the teaching of Dodley et al. with the modified optical space communication system of Javitt et al. and Heidemann because the equation of Dodley et al. gives a systematical method for estimating attenuation and engineering the system. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to expect a transmitting beam, with appropriate transmitting power and receiver, to transmit over a distance of at least 1000 meters, as taught by Dodley et al., in the modified optical space communication system of Javitt et al. and Heidemann based on the equation provided by Dodley et al. because it gives a systematical method for estimating attenuation and engineering the system.

11. Claims 209, 230 and 245 are rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand and Britz et al. as applied to claims 187-189, 197, 199-201, 205-206, 240-242 and

244 above, and further in view of Masuda et al. (H. Masuda et al., "Wideband, Gain-Flattened, Erbium-doped Fiber Amplifiers with 3dB Bandwidths of > 50 nm", Electronics Letters, Vol. 33, No. 12, 5th June 1997).

Willebrand and Britz et al. have been discussed above in regard to claims 187, 205-206, 210, 212, 217, 219, 224-226, 240-241, 244 and 246. The difference between Willebrand and Britz et al. and the claimed invention is that Willebrand and Britz et al. do not teach a bandwidth of at least 40 nm. Masuda et al. discloses in FIG. 1 an EDFA with a bandwidth of at least 50 nm. One of ordinary skill in the art would have been motivated to combine the teaching of Masuda et al. with the modified optical space communication system of Willebrand and Britz et al. because an EDFA with wider bandwidth can accommodate more wavelength channels. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the EDFA of Masuda et al. in the modified optical space communication system of Willebrand and Britz et al. because an EDFA with wider bandwidth can accommodate more wavelength channels.

12. Claim 210-212 are rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand (U.S. Patent 6,239,888 B1) in view of Heidemann (U.S. Patent 5,335,109).

Willebrand teaches in FIG. 2 an optical space communication system with transceiver 30 for transmitting a data-carrying light beam through atmosphere to a remote transceiver where the light beam is received and directed into a fiber 34. FIG. 2 also includes EDFA 36 for changing the amplitude of the received beam. The difference between Willebrand and the claimed invention is that Willebrand does not teach a variable amplification with a dynamic range of at least 30 dB. Heidemann teaches in FIG. 1 an optical receiver of high dynamic range and

automatic gain control. One of ordinary skill in the art would have been motivated to combine the teaching of Heidemann with the optical space communication system of Willebrand because large dynamic range can correct large fluctuation due to severe weather conditions. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an optical amplifier of large dynamic range, as taught by Heidemann, in the optical space communication system of Willebrand because large dynamic range can correct large fluctuation due to severe weather conditions.

13. Claims 213 and 215 are rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand and Heidemann as applied to claims 210-212 above, and further in view of Sugawara (U.S. Patent 6,057,951).

Willebrand and Heidemann have been discussed above in regard to claims 187, 205-206, 210, 212, 217, 219, 224-226, 240-241, 244 and 246. The difference between Willebrand and Heidemann and the claimed invention is that Willebrand and Heidemann do not teach providing for each distinct wavelength of beam with substantially constant amplitude. Sugawara teaches in FIG. 13 an optical fiber amplifier 1 with variable gain. Sugawara teaches in FIG. 14 that output optical power is at a constant. One of ordinary skill in the art would have been motivated to combine the teaching of Sugawara with the modified optical space communication system of Willebrand and Heidemann because a constant power level gives the optical detector an optimal performance. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to control the amplifier to give a constant output power level for each distinct wavelength, as taught by Sugawara, in the modified optical space communication system

of Willebrand and Heidemann because a constant power level gives the optical detector an optimal performance.

14. Claims 216 are rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand and Heidemann as applied to claims 210-212 above, and further in view of Masuda et al. (H. Masuda et al., "Wideband, Gain-Flattened, Erbium-doped Fiber Amplifiers with 3dB Bandwidths of > 50 nm", Electronics Letters, Vol. 33, No. 12, 5th June 1997).

Willebrand and Heidemann have been discussed above in regard to claims 210-212. The difference between Willebrand and Heidemann and the claimed invention is that Willebrand and Britz et al. do not teach a bandwidth of at least 40 nm. Masuda et al. discloses in FIG. 1 an EDFA with a bandwidth of at least 50 nm. One of ordinary skill in the art would have been motivated to combine the teaching of Masuda et al. with the modified optical space communication system of Willebrand and Heidemann because an EDFA with wider bandwidth can accommodate more wavelength channels. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the EDFA of Masuda et al. in the modified optical space communication system of Willebrand and Heidemann because an EDFA with wider bandwidth can accommodate more wavelength channels.

15. Claims 217-219 and 226-227 are rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand (U.S. Patent 6,239,888 B1) in view of Okamura (H. Okamura, "Automatic Optical Loss Compensation with Erbium-Doped Fiber Amplifier", Journal of Lightwave Technology, Vol. 10, No. 8, August 1992).

Willebrand has been discussed above in regard to claims 224-225. The difference between Willebrand and the claimed invention is that Willebrand does not teach a variable

amplifier with fast frequency response. Okamura teaches in FIG. 1 an optical amplifier with fast frequency response. Okamura illustrates in FIG. 13 that the amplitude changing rate is at least 1 KHz. One of ordinary skill in the art would have been motivated to combine the teaching of Okamura with the space communication system of Willebrand because the amplifier of Okamura can eliminate unwanted fast optical loss variation. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an optical amplifier with fast frequency response, as taught by Okamura, in the space communication system of Willebrand because the amplifier of Okamura can eliminate unwanted fast optical loss variation.

16. Claims 223 and 230 are rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand and Okamura as applied to claims 217-219 and 226-227 above, and further in view of Masuda et al. (H. Masuda et al., "Wideband, Gain-Flattened, Erbium-doped Fiber Amplifiers with 3dB Bandwidths of > 50 nm", Electronics Letters, Vol. 33, No. 12, 5th June 1997).

Willebrand and Okamura have been discussed above in regard to claims 217-219 and 226-227. The difference between Willebrand and Okamura and the claimed invention is that Willebrand and Okamura do not teach a bandwidth of at least 40 nm. Masuda et al. discloses in FIG. 1 an EDFA with a bandwidth of at least 50 nm. One of ordinary skill in the art would have been motivated to combine the teaching of Masuda et al. with the modified optical space communication system of Willebrand and Okamura because an EDFA with wider bandwidth can accommodate more wavelength channels. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the EDFA of Masuda et al. in the modified optical space communication system of Willebrand and Okamura because an EDFA with wider bandwidth can accommodate more wavelength channels.

17. Claims 224 and 231-232 are rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand (U.S. Patent 6,239,888 B1).

Willebrand discloses in FIG. 4 an optical repeater for space communication comprising a receiver 32 for receiving a data-carrying light beam, an erbium doped fiber amplifier (ERDA or EDFA). The difference between FIG. 4 and the claimed invention is that FIG. 4 does not teach variable amplification or attenuation. Willebrand discloses in FIG. 10 a transceiver with a controller for controlling transmitting power. Willebrand teaches in col. 13, lines 40-53 to use a controller to adjust power level for station with which it communicates. The adjustment compensates for variation due to changing atmosphere conditions. One of ordinary skill in the art would have been motivated to combine the teaching of FIG. 10 of Willebrand with FIG. 4 of Willebrand because varying the amplification or attenuation to overcome changing atmosphere conditions gives a constant and optimum power transmission level for the station with which the repeater communicates. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to varying amplification or attenuation of EDFA via a controller, as taught by FIG. 10 of Willebrand, in the optical repeater of FIG. 4 of Willebrand because varying the amplification or attenuation to overcome changing atmosphere conditions gives a constant and optimum power transmission level for the station with which the repeater communicates.

18. Claims 228-229, 233 and 236-237 are rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand and Okamura as applied to claims 217-219 and 226-227 above, and further in view of Terahara (U.S. Patent 6,134,034).

Willebrand and Okamura have been discussed above in regard to claims 217-219 and 226-227. Regarding claims 228 and 233, the difference between Willebrand and Okamura and

the claimed invention is that Willebrand and Okamura do not teach to have constant power. Terahara teaches in FIG. 9 to use spectrum monitor and variable attenuators to adjust power of each channel to have constant power level. One of ordinary skill in the art would have been motivated to combine the teaching of Terahara with the modified optical communication system of Willebrand and Okamura because keeping power level of each channel at constant level ensures the performance of each individual channel. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust power level of each channel based on spectrum monitor and via variable attenuators, as taught by Terahara, in the modified optical communication system of Willebrand and Okamura because keeping power level of each channel at constant level ensures the performance of each individual channel.

Regarding claim 229, the modified space optical communication system of Willebrand, Okamura and Terahara would include adjustable optical attenuator.

Regarding claim 236, Okamura teaches a variable amplifier with variation rate of at least 1 KHz.

Regarding claim 237, Willebrand teaches WDM system (see col. 8, lines 19-20).

19. Claims 234-235 are rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand, Okamura and Terahara as applied to claims 228-229, 233 and 236-237 above, and further in view of Masuda et al. (H. Masuda et al., "Wideband, Gain-Flattened, Erbium-doped Fiber Amplifiers with 3dB Bandwidths of > 50 nm", Electronics Letters, Vol. 33, No. 12, 5th June 1997).

Willebrand, Okamura and Terahara have been discussed above in regard to claims 228-229, 233 and 236-237. Regarding claim 234, the difference between Willebrand, Okamura and

Terahara and the claimed invention is that Willebrand, Okamura and Terahara do not teach a bandwidth of at least 40 nm. Masuda et al. discloses in FIG. 1 an EDFA with a bandwidth of at least 50 nm. One of ordinary skill in the art would have been motivated to combine the teaching of Masuda et al. with the modified optical space communication system of Willebrand, Okamura and Terahara because an EDFA with wider bandwidth can accommodate more wavelength channels. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the EDFA of Masuda et al. in the modified optical space communication system of Willebrand, Okamura and Terahara because an EDFA with wider bandwidth can accommodate more wavelength channels.

Regarding claim 235, Okamura teaches a variable amplifier with variation rate of at least 1 KHz.

20. Claims 238 and 239 are rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand, Okamura and Terahara as applied to claims 228-229, 233 and 236-237 above, and further in view of Jackel (U.S. Patent 6,175,436 B1).

Willebrand, Okamura and Terahara have been discussed above in regard to claims 228-229, 233 and 236-237. The difference between Willebrand, Okamura and Terahara and the claimed invention is that Willebrand, Okamura and Terahara do not teach a saturated optical amplifier. Jackel teaches in col. 3, lines 4-14 that it is desirable to operate an EDFA in saturation due to signal-to-noise ratio consideration and clamped output level. One of ordinary skill in the art would have been motivated to combine the teaching of Jackel with the modified optical space communication system of Willebrand, Okamura and Terahara because of the said advantages. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was

made to operate a EDFA in saturation, as taught by Jackel, in the modified optical space communication system of Willebrand, Okamura and Terahara because it gives better signal-to-noise ratio and clamps output power at a fixed level.

21. Claim 243 is rejected under 35 U.S.C. 103(a) as being unpatentable over Willebrand and Britz et al. as applied to claims 187-189, 197, 199-201, 205-206, 240-242 and 244 above, and further in view of Terahara (U.S. Patent 6,134,034).

Willebrand and Britz et al. have been discussed above in regard to claims 187-189, 197, 199-201, 205-206, 240-242 and 244. The difference between Willebrand and Britz et al. and the claimed invention is that Willebrand and Okamura do not teach to have constant power. Terahara teaches in FIG. 9 to use spectrum monitor and variable attenuators to adjust power of each channel to have constant power level. One of ordinary skill in the art would have been motivated to combine the teaching of Terahara with the modified optical communication system of Willebrand and Britz et al. because keeping power level of each channel at constant level ensures the performance of each individual channel. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust power level of each channel based on spectrum monitor and via variable attenuators, as taught by Terahara, in the modified optical communication system of Willebrand and Britz et al. because keeping power level of each channel at constant level ensures the performance of each individual channel.

Response to Arguments

22. Applicant's arguments filed 22 February 2005 have been fully considered but they are not persuasive.

Regarding claim 187, the Applicant argues that it would not have been obvious to combine the teaching of either Javitt or Willebrand with Heidemann (p.11 of amendment). Javitt and Willebrand relate to free space transmission, while Heidemann relates to transmission through fibers. The Examiner disagrees. The use of optical amplifiers to boost strength of optical signal is well known in the art regardless of the source and method for generating and transmitting the signal. (However, the kind of amplifiers may depend on the wavelengths of the optical signal.) For example, Caplan et al. (U.S. Patent 6,694,104 B1) teaches in FIG. 2 an EDFA amplifier 26 for boosting optical signal received by the receiver 16 via a transmission channel 14. Caplan et al. teaches in col. 4, lines 43-45 that the channel 14 may be any communication channel such as an optical fiber channel, waveguide channel or free space.

The Applicant further argues that the motivation for combining Willebrand and Heidemann is improper because in free space transmission, too high a reception signal is not a possibility to worry about (p. 11 of amendment). In response, the Examiner recognizes that the reception signal may be weak in free space and Willebrand includes an ERDA to boost the strength of the received optical signal. Also high sensitive photodetector may be used for converting optical signal to electrical signal. Without variable attenuator for properly adjusting power level, the optical signal, amplified by the ERDA, can damage the sensitive photodetector.

The Applicant argues that both of the combined references (Javitt and Heidemann) are missing the limitation "directing a received beam including at least a portion of the transmitted beam into at least one fiber" (p. 12 of amendment). The Examiner disagrees. Since the amplifier of Heidemann is an erbium-doped fiber amplifier, the modified optical space

communication system of Javitt and Heidemann would have directed the received beam to a fiber, such as fiber 3 of FIG. 1 of Heidemann.

The Applicant indicates that Heidemann does not teach an 80dB dynamic range and argues that the number (80 dB) relates to the entire system of Heidemann, including photodiode 1 and pre-amplifier 2, which contribute nearly all the dynamic range of the system. The Applicant cites a commercial product from Onetta to support the argument. The Examiner disagrees. While there are EDFA with low amplification, it does not imply that the amplifier of Heidemann must have the same low amplification. In fact, amplification depends on pump power and fiber length. Yamada et al. (U.S. Patent 6,236,496 B1) teaches in FIG. 6 the relationship between pump power and gain. The diagram shows that by varying pump power from 3mW to 108 mW, the gain varies from –10 dB to 35 dB, a range of over 40 dB, at 1.55 μm wavelength.

23. In response to applicant's argument that Willebrand does not teach "eliminates effects of atmosphere turbulence" as recited in claim 224, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 370 F.2d 576, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 312 F.2d 937, 939, 136 USPQ 458, 459 (CCPA 1963).

24. The other arguments are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shi K. Li whose telephone number is 571 272-3031. The examiner can normally be reached on Monday-Friday (8:30 a.m. - 5:00 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

skl
6 June 2005

SKLi

Shi K. Li
Patent Examiner

Sk 6/10/05

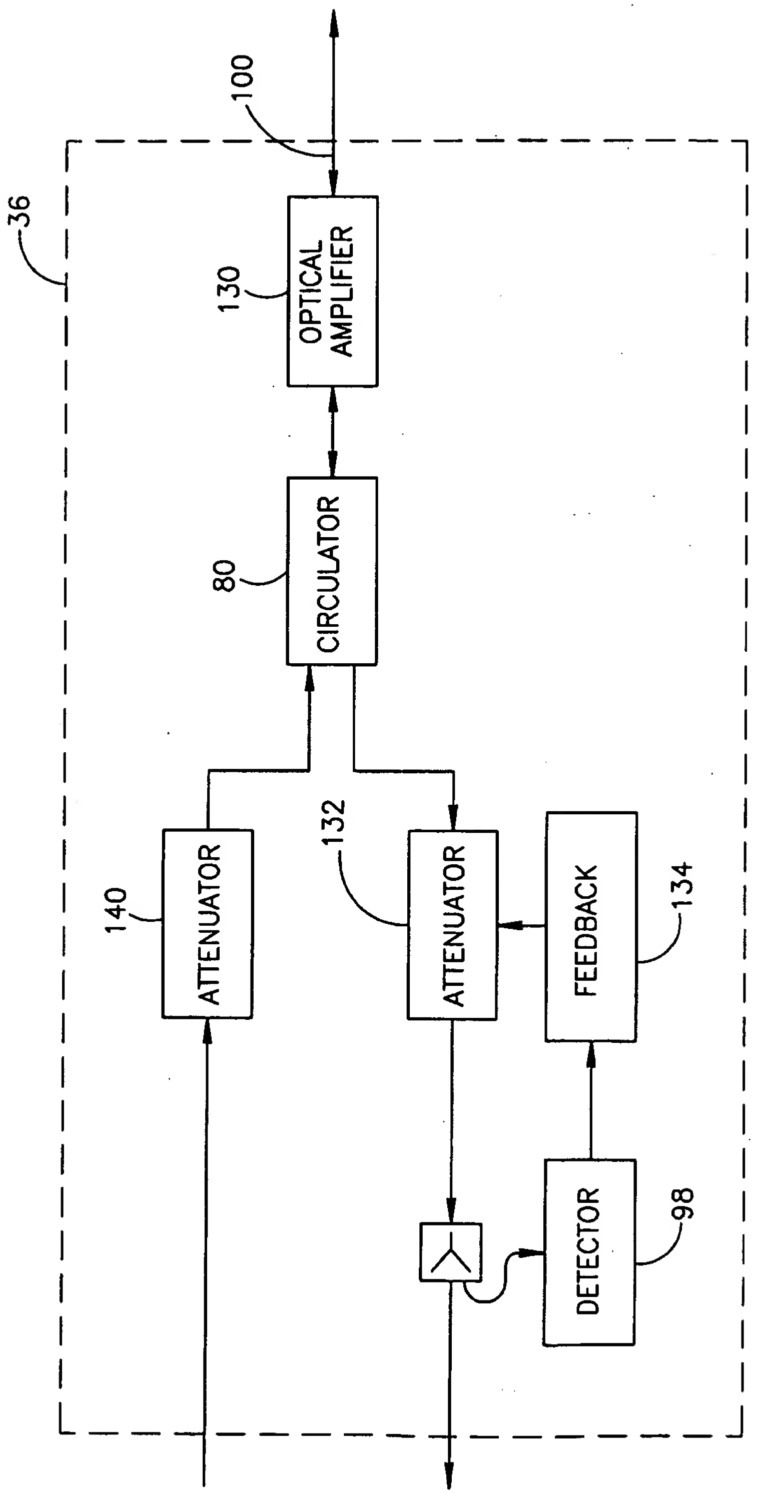

FIG.7A

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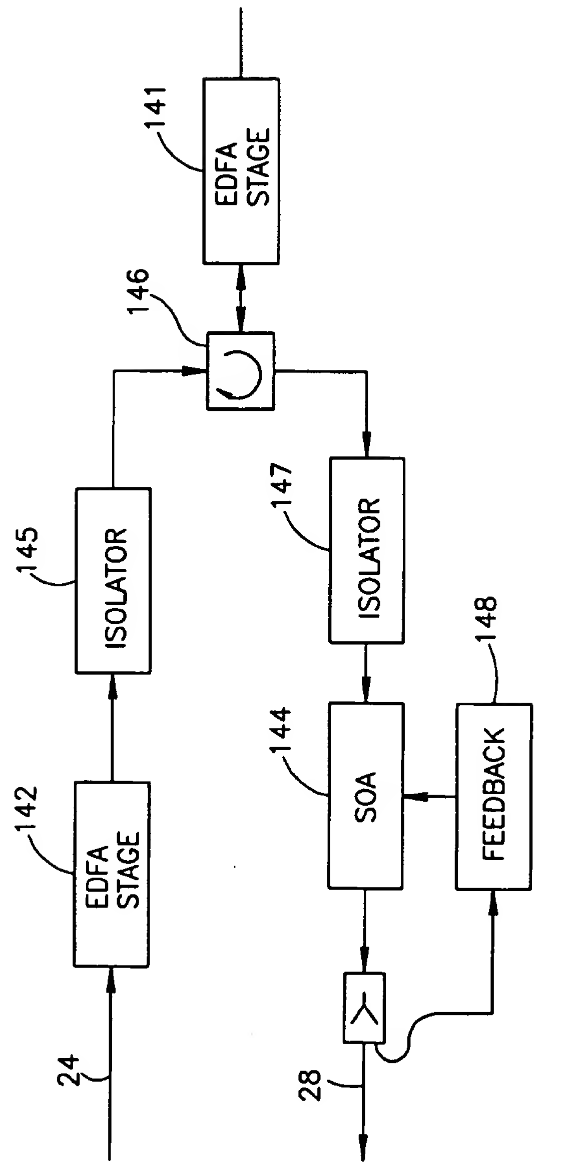

FIG.7B

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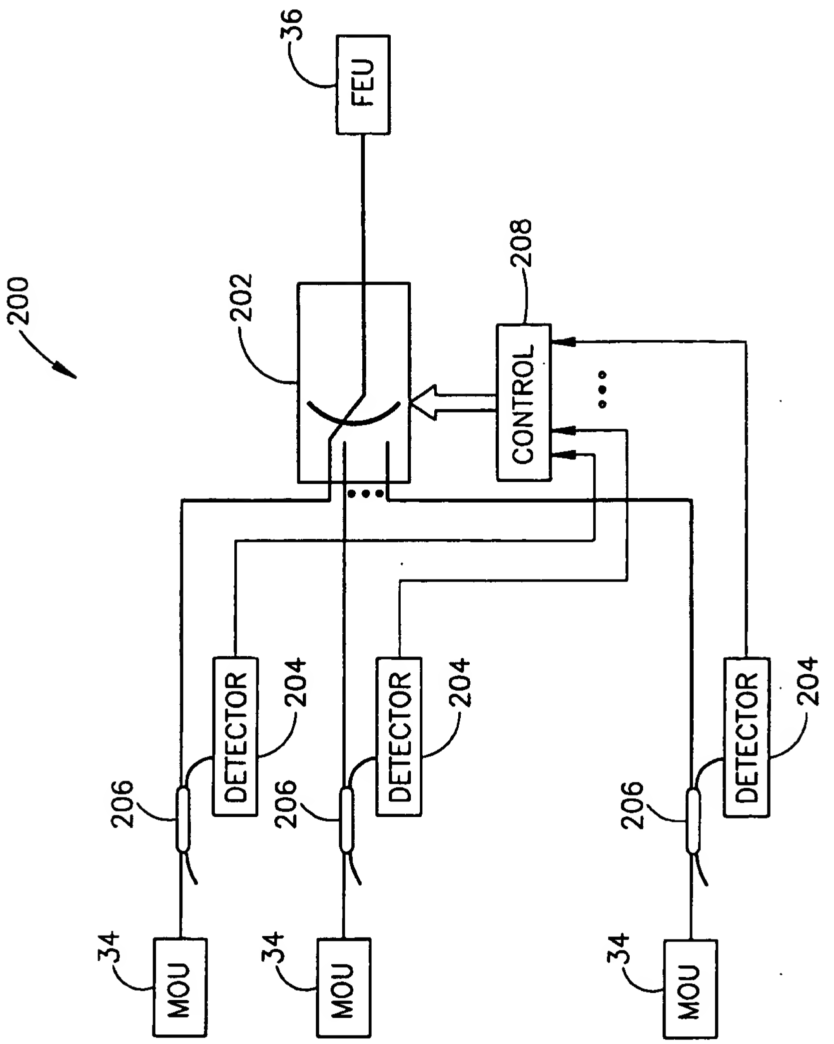

FIG.9

Sk 6/10/05

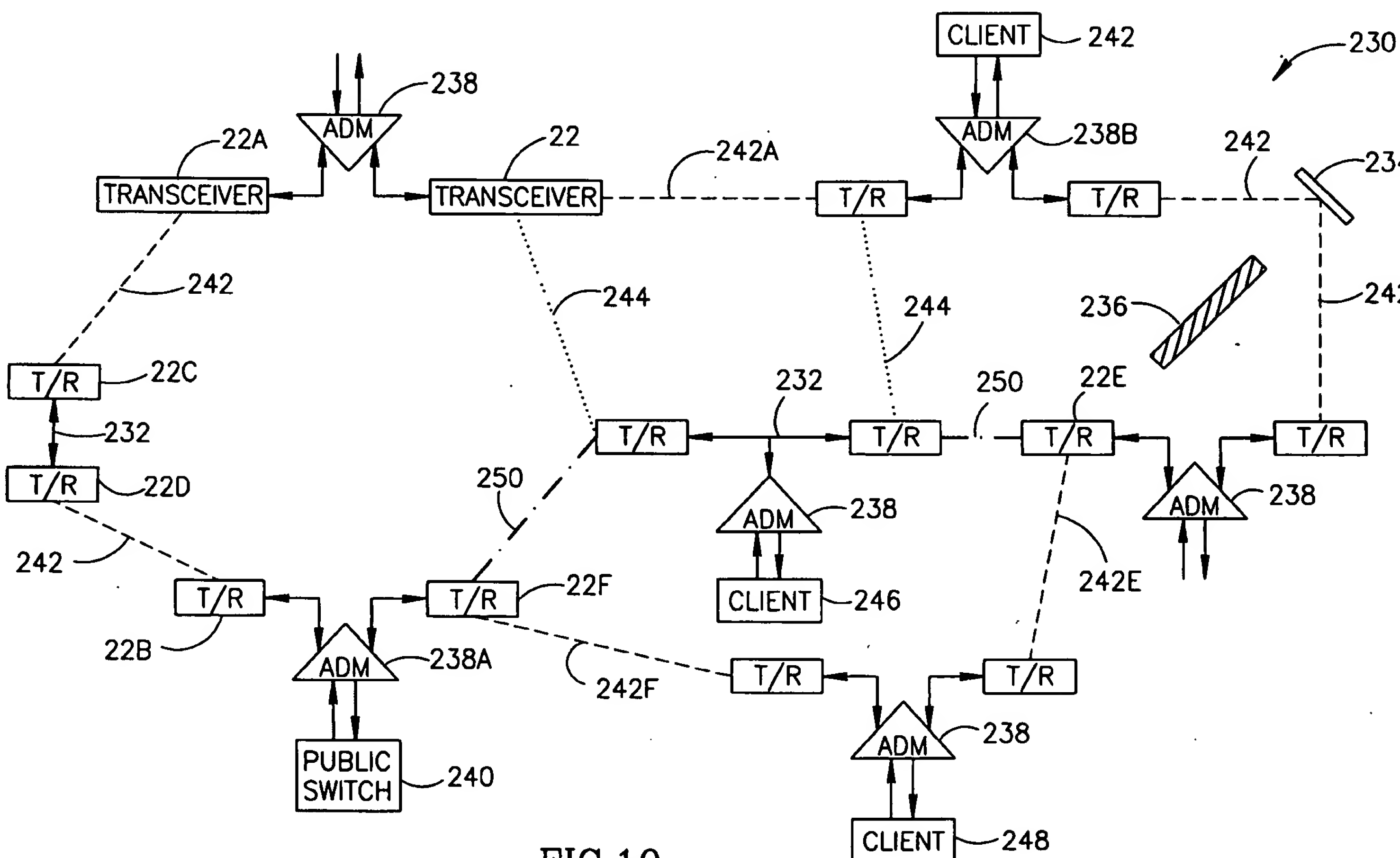

FIG.10